RX15

DIRECT GAS-FIRED CONSTRUCTION HEATER TECHNICAL MANUAL

⚠GENERAL HAZARD WARNING:

Failure to comply with the precautions and instructions provided with this heater, can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning, and / or electrical shock.

Only persons who can understand and follow the instructions should use or service this heater.

If you need assistance or heater information such as an instructions manual, label, etc. contact the manufacturer.

⚠WARNING:

Fire, burn, inhalation, and explosion hazard. Keep solid combustibles, such as building materials, paper, or cardboard, a safe distance away from the heater as recommended by the instructions. Never use the heater in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

⚠WARNING:

Not for home or recreational vehicle use.

FOR YOUR SAFETY:

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

This heater is designed and approved for use as a construction heater in accordance with standard ANSI Z83.7 • CGA 2.14. CHECK WITH YOUR LOCAL FIRE SAFETY AUTHORITY IF YOU HAVE QUESTIONS ABOUT APPLICATIONS.

DESIGN CERTIFIED

Made in the USA

RxHeat™

RX-TM-0909
RX15
09/11/09

LIMITED WARRANTY

Cambridge Engineering, Inc. ("Manufacturer") warrants its products ("the Products") to be free from defects in material and workmanship. Manufacturer's Rx-Series Products shall be warranted for a period of 12 months from the date of shipment, except that burner assemblies are warranted for five years from date of shipment.

Buyer's sole and exclusive remedy for any nonconformity with this warranty shall be, at Manufacturer's option, repair or replacement of nonconforming parts, provided that Buyer shall return to Manufacturer, shipping prepaid, said non-conforming part(s) bearing a durable tag indicating the Serial Number of the Product from which the part was taken. In addition, Manufacturer may opt not to repair or replace nonconforming Product or part(s), but instead may refund to Buyer the price thereof, in lieu of repair or replacement. In no event shall Manufacturer be liable for more than a refund of the purchase price or replacement value of the Product or part(s), whichever is less. This Warranty does not apply to field labor charges.

This Warranty does not apply and shall be void as to any Products that are misused or misapplied, that are installed, operated or maintained not in conformity with Manufacturer's design, specifications, instructions, or Technical Manual, or are installed, operated or maintained in violation of any applicable national or local codes or industry standards.

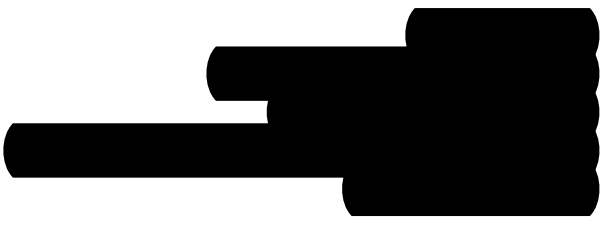
Manufacturer does not warrant Products, if they are abused, improperly operated or maintained, subjected to abnormal wear and tear, damaged due to improper gas or electric service, damaged in transit, or that have been repaired or modified by others without Manufacturer's written authorization.

Buyer shall have no right to enforce this Warranty unless it has complied with all of its obligations under the contract for purchase/lease of the Products, including without limitation, being current on all payment terms.

THIS LIMITED WARRANTY IS MANUFACTURER'S ONLY WARRANTY WITH RESPECT TO THE PRODUCTS, AND IT IS IN LIEU OF AND SUPERSEDES ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER WRITTEN, ORAL OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES AFFORDED BUYER BY THIS WARRANTY ARE THE ONLY REMEDIES AFFORDED BUYER FOR ANY NONCONFORMITY WITH THIS WARRANTY OR FOR ANY DEFECT IN PRODUCTS, SERVICES, OR REPRESENTATIONS PROVIDED BY MANUFACTURER IN CONNECTION WITH SUCH PRODUCTS. IN NO EVENT SHALL MANUFACTURER BEAR ANY LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE, LOST PROFITS OR OTHER ECONOMIC LOSS.

Buyer acknowledges that the foregoing warranty, limitations, and exclusions are a reasonable allocation of commercial risks by and among sophisticated business entities and are not subject to dispute as to their commercial reasonableness, fairness or ability to satisfy the essential purposes of the parties' transaction.

Cambridge Engineering, Inc, has a continuous product improvement program; it reserves the right to change design and specifications without notice.



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RX15
Direct Gas-Fired
Construction Heater
Technical Manual

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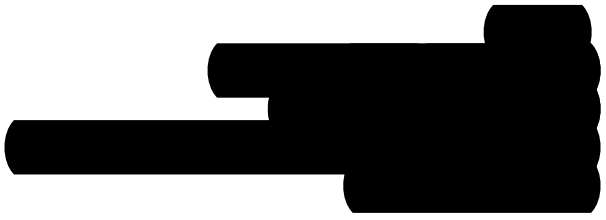


HAZARD SUMMARY

HAZARD IDENTIFICATION

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

⚠WARNING: **Indicates a potentially hazardous situation which could result in death or serious injury.**

⚠CAUTION: **Indicates a potentially hazardous situation which may result in minor or moderate injury. It may also be used to alert against unsafe practices.**

CAUTION: **Indicates a situation that may result in accidents with equipment or property damage only.**

The following safety precautions apply to the operation and maintenance of the equipment described by this technical manual.

⚠WARNING:
Any unauthorized modification of this equipment shall void warranty.

⚠WARNING:
Operation, service, and repair of this equipment could result in exposure to electrical, mechanical or other potential safety hazards and should only be performed by qualified personnel. Use extreme caution and observe safety regulations at all times.

⚠WARNING:
Recirculation of room air is not permitted.
Lack of proper ventilation air will lead to improper combustion. Improper combustion can lead to carbon monoxide poisoning leading to serious injury or death. Symptoms of carbon monoxide poisoning can include headaches, dizziness and difficulty breathing.

⚠WARNING:
All factory provided lifting lugs must be used when lifting any unit. Failure to comply with this safety precaution could result in property damage, serious injury or death.

This heater is designed for outdoor use only. It is intended for use in providing portable, temporary heat to buildings under construction, alteration or repair. Adequate ventilation must be provided while heater is operating. Combustible solids, such as building materials, paper or cardboard must be kept a minimum of 6 inches from the sides and top of the heaters, 0 inches from the bottom. Never use this heater in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

Adequate building relief shall be provided so as to not over pressurize the building when this heater is operating at its rated capacity. It should be noted that this can be accomplished by taking into account, through standard engineering methods, the structure's designed infiltration rate, by providing properly sized relief openings, by interlocking a powered exhaust system or by a combination of these methods.

IMPORTANT:
If in doubt regarding heater operation, contact RxHeat Customer Service Group at 1-800-473-4569 during the hours of 8:00 a.m. to 5:00 p.m. Central Time, Monday through Friday.

These instructions must be retained for future reference.

SYSTEM DESCRIPTION

The RxHeat® RxHeat Heater, with high temperature rise Blow-Thru® Technology, includes a control system that is designed to electronically modulate the gas flow using an amplifier, discharge temperature sensor and heat adjustment dial. The discharge temperature sensor, which is mounted in the heater's discharge air stream, transmits a resistance signal back to the amplifier that corresponds to the discharge temperature. The amplifier creates a voltage output to drive an electronic proportioning gas valve to maintain the pre-selected temperature that is set on the heat adjustment dial.

The RxHeat® RxHeat Heater is provided with a variable frequency drive (VFD) to allow for variable air volume between 4000 and 6000 CFM. The VFD air volume control is located in the operator interface panel. The VFD also limits the fan motor inrush current, allowing the heater to be powered by generator.

CONTROL SYSTEMS:

ELECTRONIC DISCHARGE - LOCAL (EDL)

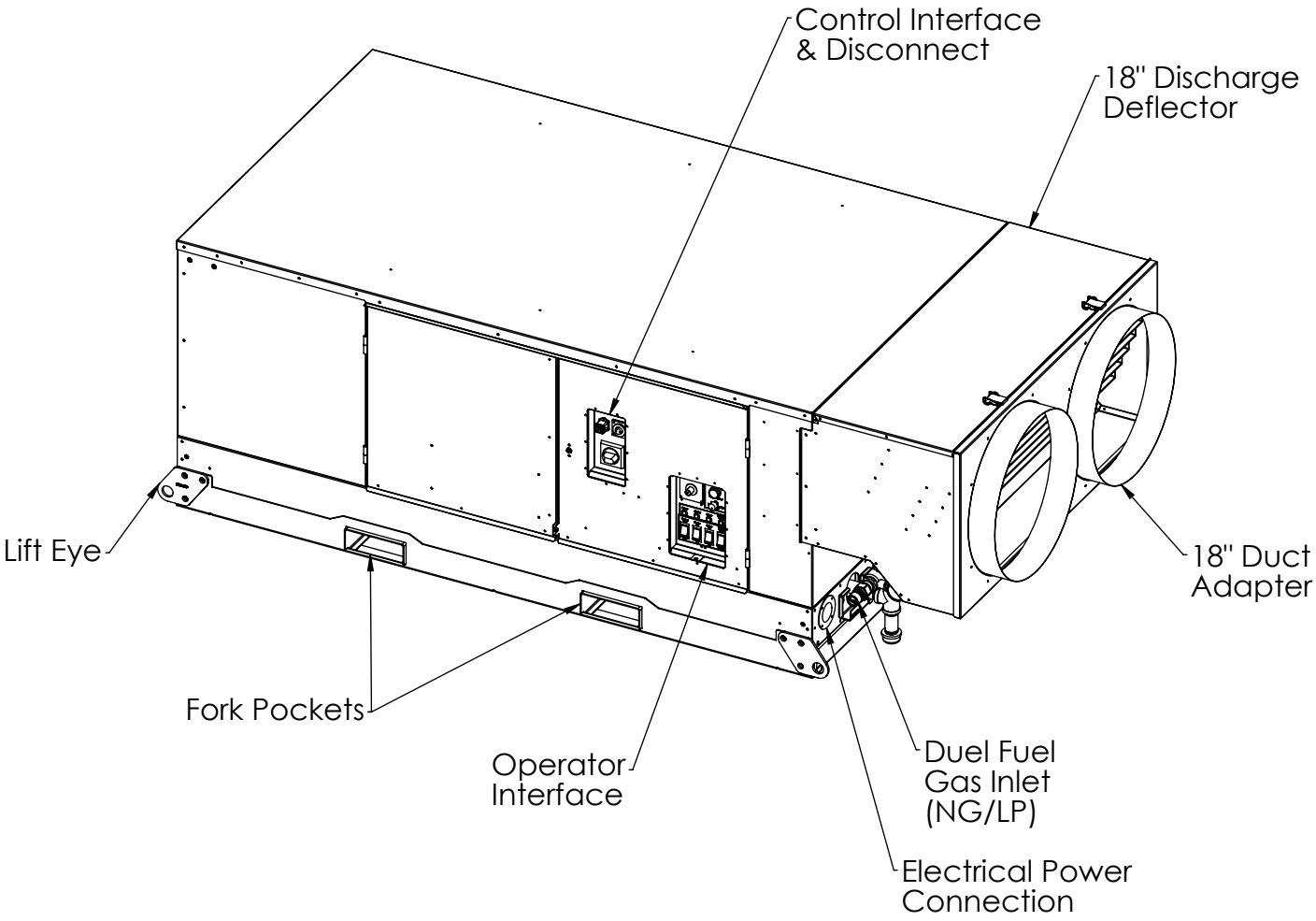
The EDL temperature control system utilizes a discharge temperature sensor, which is mounted at the unit's discharge, to transmit a signal back to the amplifier that corresponds to the discharge temperature. This permits the adjustment of the discharge air temperature (120°F to 170°F) from the heater's operator interface panel.

ELECTRONIC DISCHARGE - REMOTE SPACE MODULATION (EDSM)

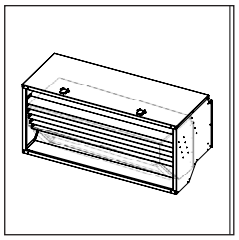
The Electronic Discharge w/ Space Modulation temperature control has two modes of operation. The first mode permits the adjustment of the discharge air temperature from the heater's operator interface panel as described above. The second mode utilizes a Remote Space Sensor (RSS), located in the heated space, which transmits a signal to the amplifier to maintain the user-defined space temperature. The RSS allows the heater to modulate between programmed MAX and MIN parameters, factory preset to 210˚F and 40˚F respectively. The space temperature is field adjustable between 60˚F and 140˚F.

COMPONENT IDENTIFICATION

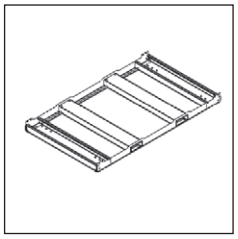
Unit shown with Accessory Options



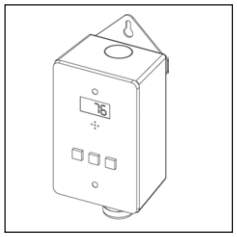
ACCESSORY OPTIONS



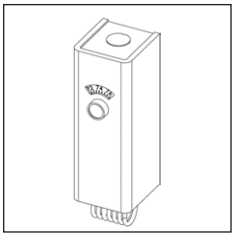
18" Discharge Deflector:
Factory installed option. Includes turning vanes. Attaches directly to the discharge of the unit.



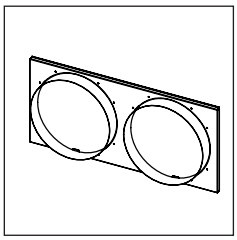
Unit Base Assembly: Factory installed option with integral fork lift pockets.



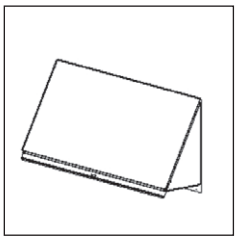
RSS (Remote Space Sensor)
Remote Space Sensor and Thermostat: For use in EDSM mode. RSS should be mounted in the heated space, where it modulates the heater's discharge temperature to maintain a user defined space temperature. RSS attaches to the heater at the interface on the Operator Control door and is supplied with a plug and 75' of cord.



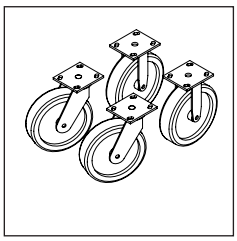
OT Remote
Operating Thermostat for use in EDL mode. The OT should be located in the heated space, where it acts to turn the heat ON and OFF to maintain user defined space temperature. In order to utilize the OT, the Blower Service must be put in the "REMOTE" position.



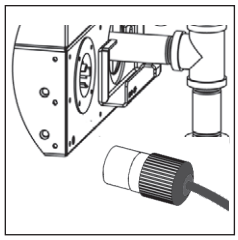
18" Discharge Adapter:
Optional discharge elbow attachments used to easily connect flexible duct for distribution of air into the building.



Rainhood: Factory installed option with integral bird screen.



Caster Set: Provides on site mobility without the use of heavy machinery. Must be used with optional base assembly.



Power Cord: 75ft., 10 gauge, 4 wire twist lock connector.

USAGE INSTRUCTIONS

⚠WARNING:
These usage instructions must be followed each time heater is put into service.

⚠WARNING:
For safety, this heater is equipped with a manual reset high limit switch, an air-proving switch and redundant electric shut-off valves. Never operate the heater with any safety device that has been bypassed. Do not operate this heater unless all of these features are fully functional.

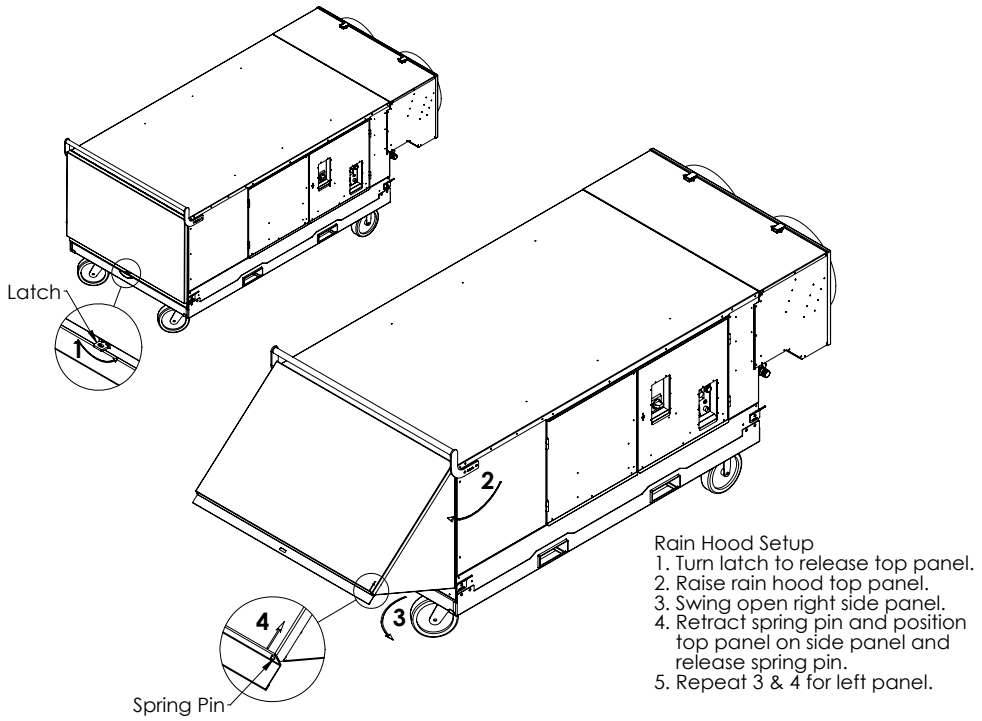
__1. VISUAL INSPECTION AND PLACEMENT OF EQUIPMENT

A. Check for any physical damage from shipping or installation that could render heater unsafe or inoperable.

B. Locate heater on level ground in close proximity to the target area and engage the optional caster wheel brakes located on the wagon's rear wheels.

⚠CAUTION:
Manufacturer requires the usage of "stop blocks" for added security.

C. If applicable, open the heater's rain hood assembly per the figure below.


Latch
1
2
3
4
Spring Pin
Rain Hood Setup
1. Turn latch to release top panel.
2. Raise rain hood top panel.
3. Swing open right side panel.
4. Retract spring pin and position top panel on side panel and release spring pin.
5. Repeat 3 & 4 for left panel.

D. Install the optional 18" diameter round flexible duct to the optional 18" discharge adaptors and then attach the adaptor to the optional air deflector, if applicable. Using the provided worm gear clamps, appropriately secure the duct to the unit's discharge.

⚠WARNING:
This unit is designed to operate using Natural Gas or Liquid Propane (LP). Failure to follow proper procedures with Natural Gas or LP can lead to fires, explosions, personal injury or death. To ensure proper operation and prevent damage to the unit and bodily injury the following instructions must be followed.

__2. GAS PIPING INSTALLATION

IMPORTANT

For a heater for connection to natural gas, the installation shall conform with local codes or, in their absence, with the National Fuel Gas Code ANSI Z223.1/NFPA 54 and the Natural Gas and Propane Installation Code, CSA B149.1.

For a heater for connection to Liquid Propane gas (LP) installation must conform with local codes or, in their absence, with the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58 and the Natural Gas and Propane Installation Code, CSA B149.1.

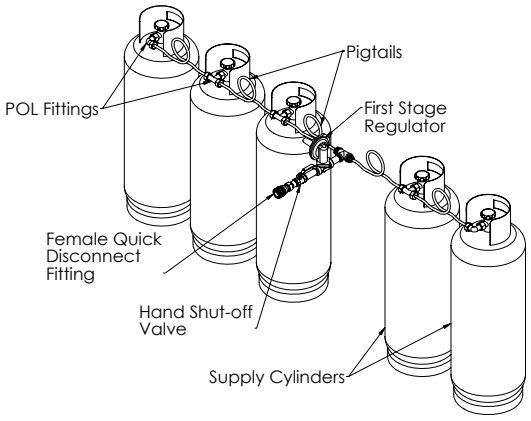
Steps B, C and D apply to a heater operating on Liquid Propane gas (LP).

⚠WARNING:
Verify the gas supply pressure complies with the heater nameplate.

A. Ensure the manual shut-off valve on the heater's external gas train is closed. Verify the unions in the gas piping are tight.

B. A minimum of four (4) 100 lb LP cylinders manifolded together, or one (1) 250 gallon LP tank is required to operate heater. Supply cylinders must be designed, fabricated, tested and marked in accordance with regulations of the U.S. Department of Transportation, Canadian Transport Commission or the Interstate Commerce Commission, and must be arranged to provide for vapor withdrawal from the operating cylinder(s).

Typical LP Supply Cylinder Assembly



IMPORTANT:
If four (4) 100 lb LP cylinders are used, they shall only be used down to 30% fill capacity, below which they may not allow the heater to operate at rated capacity.

C. LP cylinders must have a pressure regulator rated for at least 1,500,000 Btu/hr at 2 psi to 10 psi outlet pressure (located downstream of the last cylinder if multiple cylinders are manifolded together). A 1" female quick disconnect fitting shall be located downstream of the supply cylinder assembly pressure regulator(s).

⚠WARNING:
The heater must be located at least 10 feet from any propane gas container. The heater's discharge air shall not be directed toward any propane gas container within 20 feet.

⚠WARNING:

The hose assembly must be visually inspected prior to each use of the heater. If it is evident there is excessive abrasion or wear, or the hose is cut, it must be replaced prior to the heater being put into operation. The replacement hose assembly shall be 1" ID thermo-rubber gas connector with 1" male NPT on each end.

D. Connect the gas hose assembly provided with the heater between the LP cylinder(s) and the gas train.

E. Slowly open gas supply valve(s) to allow pressure in manifold assembly to equalize.

⚠WARNING:

- **Do not use open flame (matches, torches, candles, etc.) in checking for gas leaks.**
- **Use only approved leak detectors.**
- **Failure to follow this warning can lead to fires or explosions.**
- **Fires or explosions can lead to property damage, personal injury or death.**

F. Check all connections for gas leaks using approved gas leak detectors. Gas leak testing is performed as follows:

- Check all pipe connections, hose connections, fittings and adapters upstream of the gas supply inlet connection with approved gas leak detectors.
- In the event a gas leak is detected, check the components involved for cleanliness and proper application of pipe compound before further tightening.
- Further tighten the gas connections as necessary to stop the leak.
- Close the access and control panel doors and lock (reverse procedure from item E above)
- Close the external manual shut off valve.
- After all connections are checked and all leaks are stopped, proceed to next step.

__3. ELECTRICAL INSTALLATION

⚠WARNING:

Before attempting electrical installation, review the following instructions and wiring and connection diagrams to make sure you have a thorough understanding of what is required.

⚠WARNING:

This appliance is equipped with a three-prong (grounding) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle.

A. Check the heater nameplate to determine the voltage and amperage requirements. **Deviation from nameplate voltage may impact heater performance or cause damage to the heater.**

B. Install the supply wiring, adequate Branch Circuit Protection, and electric grounding in compliance with the National Electric Code ANSI/NFPA 70 or the Canadian Electrical Code C22.1, Part I.

⚠CAUTION:

Ensure that the supply voltage to the heater is within +/- 10% of the nameplate voltage.

__4. PREPARATION & START-UP INSTRUCTIONS

A. Verify that the field wiring, both primary and control, has been installed according to the RxHeat wiring diagram, National Electrical Code, and local electrical codes.

B. Ensure that the rain hood, if applicable, is locked open and the discharge accessories are securely attached. If applicable, engage the caster brakes and stop blocks.

C. Switch the voltage selector switch (see p. 13) to either 208V or 240V depending on the field wired voltage.

D. Turn the unit's Disconnect Switch to the "ON" position.

⚠WARNING:
When disconnect switch is activated with the access doors open, live power is present. Only experienced technicians with knowledge and respect for live power should proceed beyond this point.

E. Adjust airflow to desired level using the Air Volume Control dial. When using ducting, ensure that bends are kept to a minimum.

F. Turn the RxSmart™ Selector switch to the "LOCAL" position.

G. Turn the Blower Operating Switch to the "ON" position. The VFD will energize and the blower speed will slowly increase until operational speed is achieved.

H. Open internal and external manual shut-off valves located on the heaters gas train.

I. Turn the Burner ON-Off switch (located on the Control Door) to the "ON" position. The ignition sequence will begin and the burner "ON" light will energize.

IMPORTANT:
It is normal for air to be trapped in gas hose on new installations. The heater may require more than one trial for ignition before air is finally purged from line and ignition takes place. Should the burner "ON" light de-energize, cycle the Burner ON-OFF switch.

All heaters are equipped with a Low Temperature Cutoff (LTC) safety system. This system will shut off the blower at ambient temperatures below 50˚F (10˚C) if the blower operates for over 60 seconds without the burner operating. This shutdown is shown by the amber LTC Reset Light (see p13) on control panel. Should this indicator light come on, cycle the Burner ON-OFF switch to reset.

J. With the burner operating, spray the complete gas train and supply piping with leak detector solution, checking all pipe connections and plugs.

⚠WARNING:
All gas leaks detected must be repaired before heater is placed into service.

K. Adjust the temperature to the desired level using the Temperature Select Dial. Adjust the blower speed to the desired airflow level using the Air Volume Control.

L. Turn the Burner "ON-OFF" switch to the "OFF" position.

M. Turn the unit's Disconnect Switch to the "OFF" position.

N. Using the “Local/Remote” Mode RxSmart™ Switch located on the Operator Interface Panel (see pg. 13), select the unit’s control system mode.

O. When utilizing the “REMOTE” control system, connect the RSS to the RSS Interface using the Remote Space Sensor male connector.

P. Select the desired room temperature using the “Up” and “Down” arrows on the Remote Space Stat.

Q. Close and secure the Access and Control Panel Doors.

R. To restart unit for normal operation, turn unit’s Disconnect Switch to the “ON” position.

S. Turn the Burner “ON-OFF” switch to the “ON” position.

T. If applicable, press the Natural Gas Select switch.

⚠WARNING:
This unit is designed to operate using Natural Gas or Liquid Propane (LP). Failure to follow proper procedures with Natural Gas or LP can lead to fires, explosions, personal injury or death. To ensure proper operation and prevent damage to the unit and bodily injury the following instruction must be followed.

__5. HEATER SHUTDOWN AND STORAGE

A. Close LP supply cylinder valve(s) or NG supply valve. The gas must be turned off at the LP supply cylinder(s) or NG supply when the heater is not in use.

B. Allow the heater to burn off any fuel gas remaining in the gas supply line. Turn the the Burner “ON- OFF” switch to the “OFF” position. Close appropriate manual shut-off valve on the heater’s external gas train.

C. Turn the heater Disconnect switch to the “OFF” position.

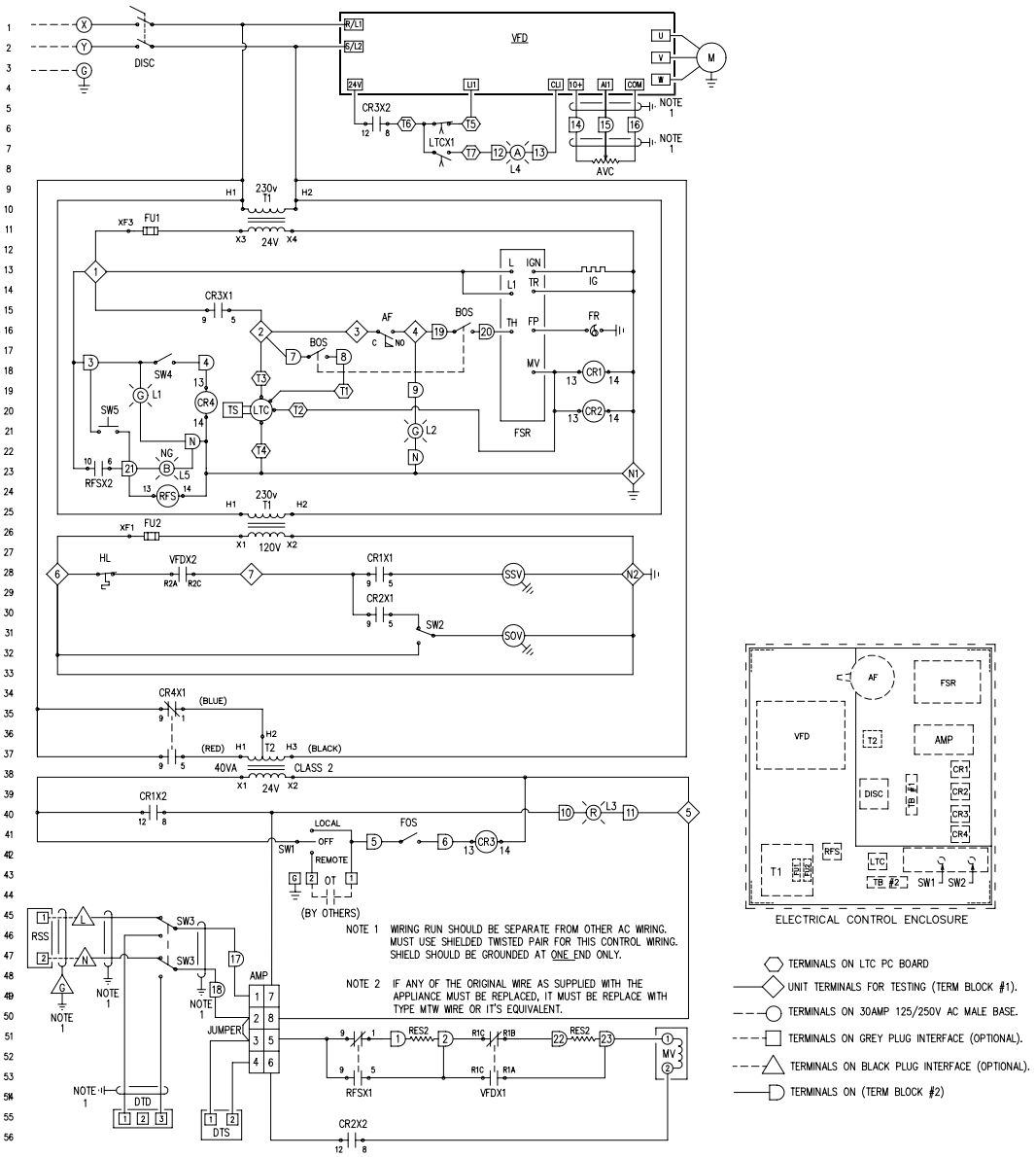
D. Disconnect the electric supply. Disconnect the gas supply piping from the heater’s external connection. Seal all gas supply inlets to prevent the entry of debris.

E. Remove any attached flexible duct. Close rain hood assembly.

F. When the heater is stored indoors, the connection between the propane supply cylinder(s) and the heater must be disconnected and the cylinder(s) removed from the heater and stored in accordance with the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58 and the Natural Gas and Propane Installation Code, CSA B149.1.

⚠WARNING:
The gas supply hose assembly shall be protected from traffic, building materials and contact with hot surfaces both during use and while in storage.

WIRING & CONNECTION DIAGRAM - EDL/EDSM CONTROLS



ELECTRICAL CONTROL ENCLOSURE

- TERMINALS ON LTC PC BOARD
- UNIT TERMINALS FOR TESTING (TERM BLOCK #1).
- TERMINALS ON 30AMP 125/250V AC MALE BASE.
- TERMINALS ON GREY PLUG INTERFACE (OPTIONAL).
- TERMINALS ON BLACK PLUG INTERFACE (OPTIONAL).
- TERMINALS ON (TERM BLOCK #2)

SYMBOL	DESCRIPTION
AF	Air Flow Switch
AMP	Amplifier Solid State
AVC	Air Volume Control
BOS	Burner ON-OFF Switch
CR1	Control Relay - Gas Valve On
CR2	Control Relay - Gas Valve On
CR3	Control RElay - Call For Blower
DISC	Service Disconnect Non - Fused
DTD	Discharge Temperature Dial
DTS	Discharge Temperature Sensor
FR	Flame Rod
FSR	Flame Safeguard Relay (HSI)
FOS	Fan Operating Switch
FU1	Fuse 24 Volt Control

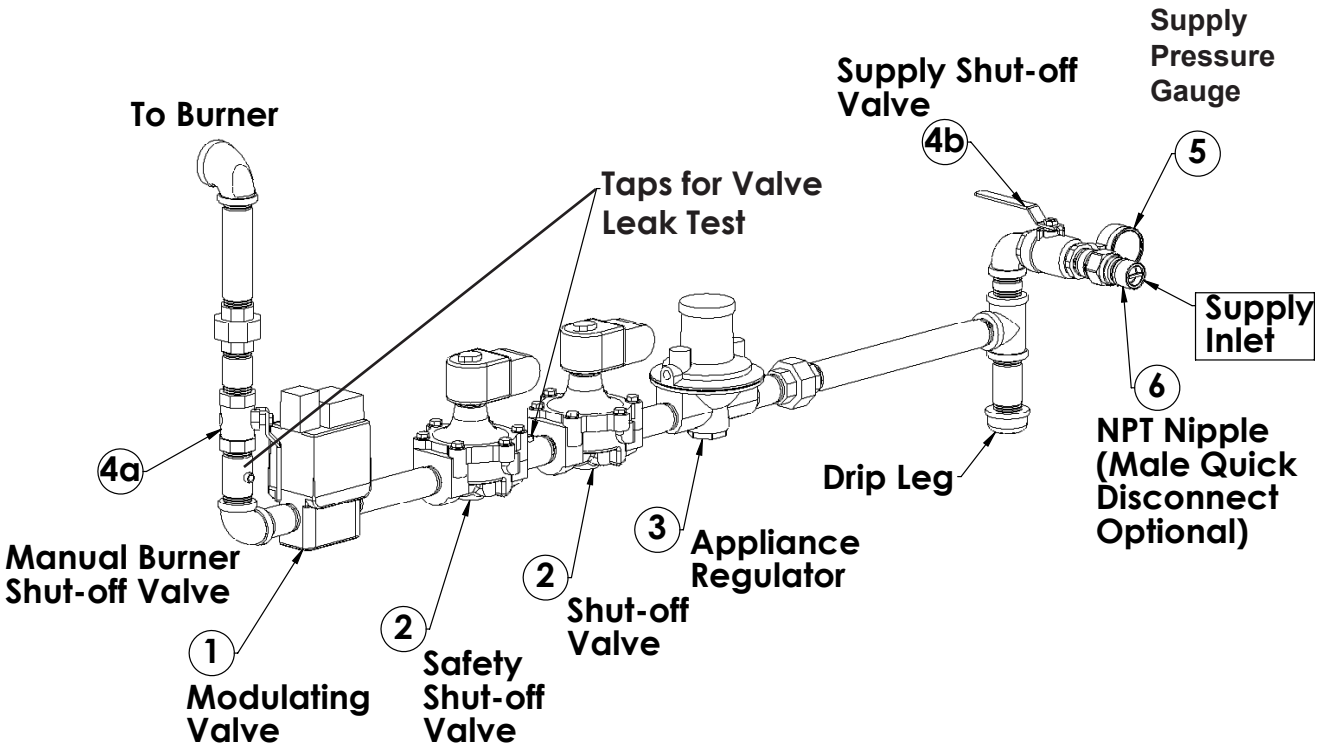
SYMBOL	DESCRIPTION
FU2	Fuse 120 Volt Control
HL	High Limit
IG	Ignitor
L1	Power
L2	Light - Air Flow Proved
L3	Light - Burner On
L4	Light - Alarm (On)
L5	Light - Natural Gas Mode
LTC	Low Temperature Cutout
M	Motor
MV	Modulating Valve
OT	Operating Thermostat (optional)
RES1	Resistor - Low Speed
RES2	Resistor - Propane Mode

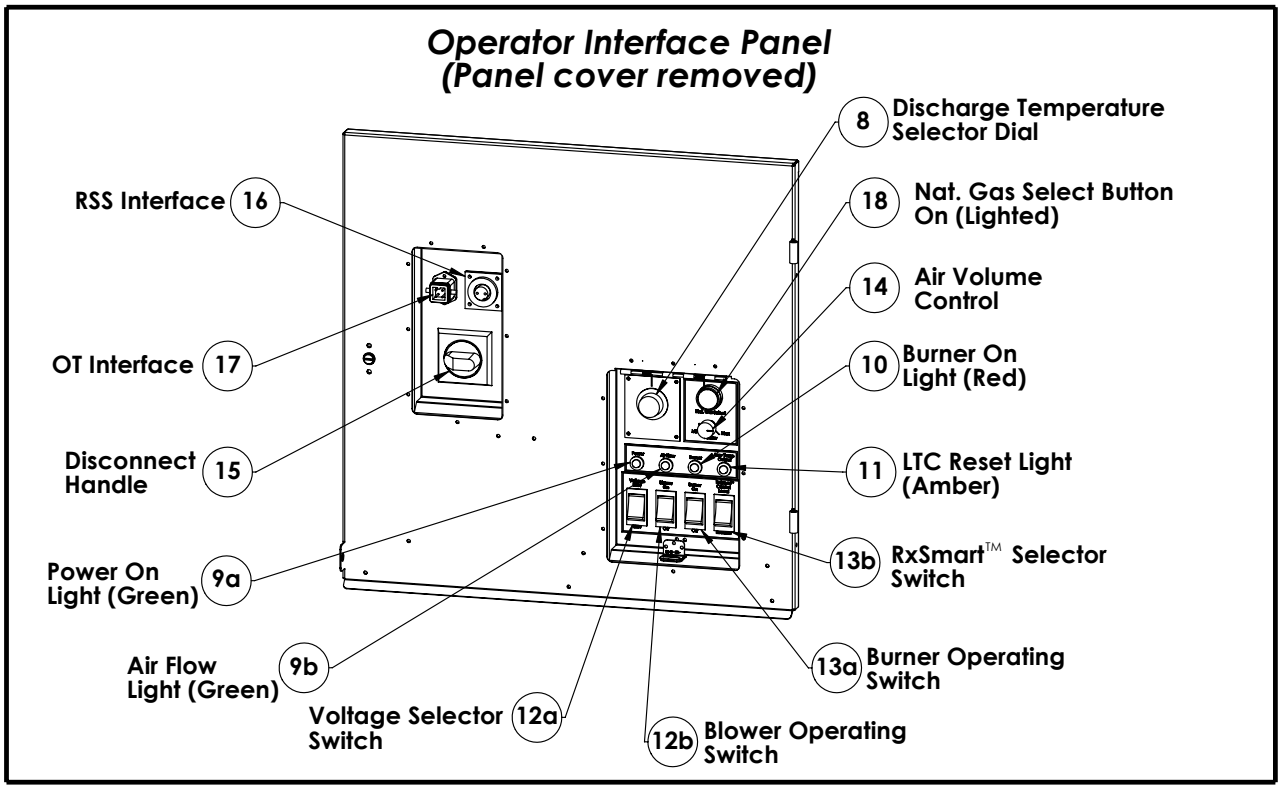
SYMBOL	DESCRIPTION
RFS	Relay - Fuel Switch
RSS	Remote Space Stat
SOV	Shut-off Valve - Gas
SSV	Safety shut-off Valve - Gas
SW1	Blower Service
SW2	Switch - SOV Leak Test
SW3	Switch - Operating Mode Selector
SW4	Switch - Voltage Select 208 / 230
SW5	Switch - Natural Gas Mode
T1	Dual Output Transformer
T2	Class 2 Transformer (24 Volt)
TS	Temperature Sensor (Part OFLTC)
VFD	Variable Frequency Drive

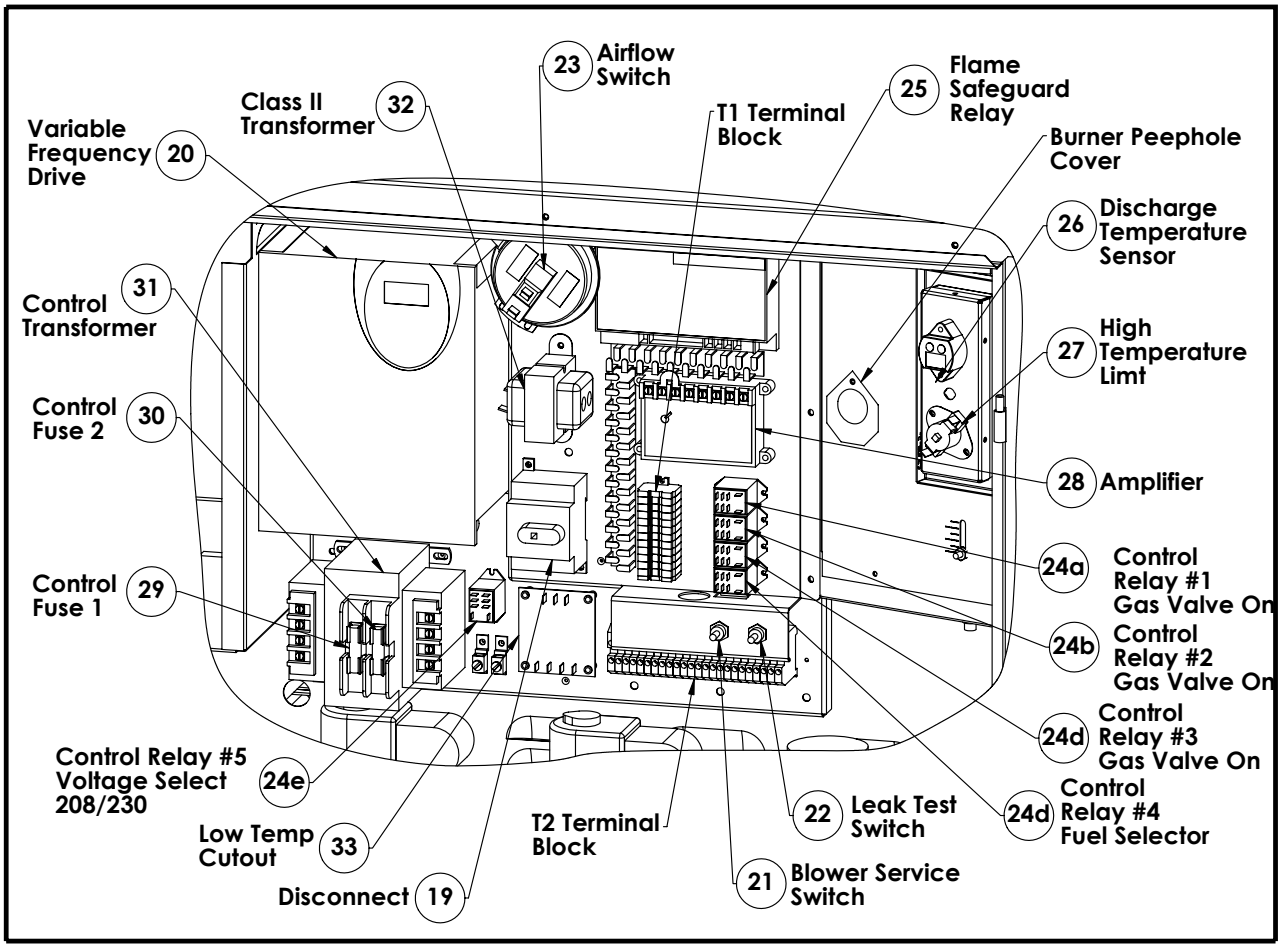
SUPPLY PRESSURE REQUIREMENTS

GAS SUPPLY PRESSURE REQUIREMENTS TABLE	NATURAL GAS	LIQUID PROPANE
Minimum gas supply pressure for maximum input adjustment	20" wc (50 mbar)	5 PSI (.35 bar)
Minimum gas supply pressure to maintain flame signal	1.0" wc (2.5 mbar)	1.0" wc (2.5 mbar)
Maximum gas supply pressure	10 PSI (.69 bar)	10 PSI (.69 bar)

GAS TRAIN COMPONENTS




Operator Interface Panel
(Panel cover removed)
8 Discharge Temperature Selector Dial
RSS Interface 16
18 Nat. Gas Select Button On (Lighted)
14 Air Volume Control
OT Interface 17
10 Burner On Light (Red)
Disconnect Handle 15
11 LTC Reset Light (Amber)
13b RxSmart™ Selector Switch
Power On Light (Green) 9a
Air Flow Light (Green) 9b
13a Burner Operating Switch
Voltage Selector Switch 12a
12b Blower Operating Switch


23 Airflow Switch
25 Flame Safeguard Relay
Class II Transformer 32
T1 Terminal Block
Variable Frequency Drive 20
Burner Peephole Cover
26 Discharge Temperature Sensor
31 Control Transformer
27 High Temperature Limt
Control Fuse 2 30
28 Amplifier
24a Control Relay #1 Gas Valve On
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24b Control Relay #2 Gas Valve On
24d Control Relay #3 Gas Valve On
Control Relay #5 Voltage Select 208/230 24e
24d Control Relay #4 Fuel Selector
22 Leak Test Switch
T2 Terminal Block
Low Temp Cutout 33
21 Blower Service Switch
Disconnect 19

COMPONENT PARTS LIST

RX15 Component Parts List

Item	Location (Manual Page)	Description	Part Number
1	Gas Train	Valve - Gas Modulating M611	24-033
2	Gas Train	Valve - Gas Shut Off	21-118
3	Gas Train	Regulator - Appliance lbs. to inches	24-008
4a.	Gas Train	Manual Burner Shut-Off Valve	24-020
4b.	Gas Train	Manual Supply Gas Shut-Off Valve	24-115
5	Gas Train	Gauge - Supply Pressure	23-633
6	Gas Train	Supply Gas Quick Disconnect - 1” NPT	44-123
7	Operator Interface	DFTD (Temperature Selection Dial)	23-016
8a	Operator Interface	Burner On Light LP (Red)	22-602
8b	Operator Interface	Burner On Light NG (Green)	22-601
9	Operator Interface	Switch - Natural Gas Select	22-295
10	Operator Interface	Air Volume Controller	22-104
11	Operator Interface	Burner On - Off Switch	22-107
12a	Operator Interface	Power Junction Box	6940-939
12b	Operator Interface	Power Inlet, Twist Lock (Optional)	22-127
13	Operator Interface	Disconnect Handle	22-276
14	Control Enclosure	Disconnect 60A Non-Fused	22-272
15	Control Enclosure	VFD 5HP 230v 1ph	23-905
16	Control Enclosure	Switch - Blower On - Off	22-040
17	Control Enclosure	Switch - SOV Leak Test (Momentary)	22-762
18	Control Enclosure	Airflow Switch	21-125
19a	Control Enclosure	Control Relay - Gas Valve ON	22-761
19b	Control Enclosure	Control Relay - Gas Valve ON	22-761
20	Control Enclosure	Control Relay - Fuel Select	22-295
21	Control Enclosure	Flame Safeguard Relay	21-142
22	Control Enclosure	Discharge Temperature Sensor	23-220
23	Control Enclosure	Switch - High Temp Limit - 250°F	23-168
24	Control Enclosure	Amplifier - Solid State (DFC-1)	23-217
25	Control Enclosure	Control Fuse 6.25 amp	22-019
26	Control Enclosure	Control Fuse 1.6 amp	22-078
27	Control Enclosure	Transformer Dual Output 350 va	22-111
28	Control Enclosure	Transformer Class 2 40va	22-678
29	Optional Control	Remote Space Sensor Female Connection	22-529
30	Optional Control	Optional Thermostat Connection	22-526
31	Optional Control	Optional Control Mode Selection Switch	22-138
-	Not Shown	Remote Space Sensor Male Connection	22-528
-	Not Shown	Room Space Sensor	23-107
-	Not Shown	50 ft. LP Supply Hose 1” NPT	44-124
-	Not Shown	Gas Quick Disconnect - Female 1” NPT	44-125
-	Not Shown	Flame Rod	21-062
-	Not Shown	Igniter - 24v Hot Surface	21-097
-	Not Shown	18" Dia. Flexible Duct - Length 25 ft.	44-133
	Not Shown	4 ft. Power Cord	19-06969
-	Not Shown	75 ft. Power Cord	19-06904

REPLACEMENT PARTS & SERVICE

Contact the RxHeat Customer Service Group at (800) 473-4569.

MAINTENANCE INSTRUCTIONS

⚠WARNING:

The heater area must be kept clear and free from combustible materials, gasoline, and other flammable vapors and liquids.

The flow of combustion and ventilation air must not be obstructed.

⚠WARNING:

Place the heater disconnect switch in the "OFF" position when performing service or maintenance functions. Heater surfaces are hot for a period of time after the heater has been shut down. Allow heater to cool before performing service, maintenance or cleaning. Failure to follow this warning will result in burns causing injury.

IMPORTANT:

The heater should be inspected before each use, and at least annually by a qualified service technician.

BLOWER BEARING LUBRICATION

The RX15 model heaters require lubrication on intervals of 3 to 6 months. Use Shell "Alvania #2" Exxon "Unirox N2" Mobil "532", Mobil "Mobilux #2", Texaco "Multifak #2", Texaco "Premium RB" lubricants.

MOTOR BEARING LUBRICATION

Motors are pre-greased normally with Shell "Dolium R". Equivalent greases which are compatible with the motor furnished grease are Chevron "SRI No. 2" and Texaco "Premium RB".

HOURS OF SERVICE PER YEAR	SUGGESTED RELUBE INTERVAL NEMA FRAME SIZE
Motor Frame Size	42 to 215T
5000 Hours	5 years
Continous Normal Application	2 years
Seasonal Service Motor Is Idle For 6 Months Or More	1 year (Beginning of Season)
Continous High Ambients, Dirty Or Moist Locations, Or High Vibration	6 months

BELT TENSIONING

Using a Browning Belt Tension Checker and a straight edge, attain proper tension according to the following table:

Model	Motor HP	Belt(s)		Nominal Deflection	Belt Tension	
		Qnty	Type		New	Used
RX15	5	2	BX	**0.25 (1/4)"**	**3 -5 lbs**	**2.5 - 4 lbs**

Periodic belt adjustments may be required. Indications of loose belts include barking or squealing when the blower starts.

ELECTRIC SHUT-OFF VALVE LEAK CHECK

⚠WARNING:
The heater shall be periodically evaluated, at least annually, for the seal tightness of the electric shut-off valves.

The heater is equipped with a leak test facility to assist in checking these seals. A momentary switch and a gas port for measuring pressure between valves are provided as the leak test hardware. The procedures for the electric shut-off valve leak check are as follows.

A. Connect a 0 to 10 inches water column (" wc) manometer to the 1/8" NPT tapped fitting located just prior to the burner. Verify the manometer is properly zeroed.

B. To check the tightness of second electric shut-off valve (SSV), close the manual burner shut-off valve, hold the momentary leak test switch in the closed position and wait 30 seconds to read the manometer. If the reading is greater than 0" wc, refer to the Maintenance Instruction Section for information on Gas Valve Cleaning for the second electric shut-off valve (SSV) and retest. If reading is 0" wc, remove the manometer, install the pipe plug and open the manual burner shut-off valve.

C. To check the gas tightness of the first electric shut-off valve (SOV) in the gas train, connect the manometer to the leak test port between the valves and wait 30 seconds to read the manometer. If the reading is greater than 0" wc, refer to the Maintenance Instruction Section for information on Gas Valve Cleaning for the first electric shut-off valve and retest. If reading is 0" wc, remove the manometer and install the pipe plug.

⚠WARNING:
Do not wash the interior of the heater. Use only compressed air, a soft brush or a dry cloth to clean the interior of the heater and its components.

BLOWER CLEANING

The blower wheel should be examined for accumulation of dust on the blades. These surfaces must be kept clean. Dirt accumulation will result in significant air flow reduction and/or possible imbalance of the blower wheel.

CAUTION:
Prolonged imbalance can result in catastrophic failure of the blower wheel and other related components.

BURNER CLEANING

The RxHeat burner is for the most part self-cleaning. However, if the application is extremely dirty or subject to heavy insect infestation, it may become necessary to periodically clean the burner. Remove and clean the burner in accordance with the following recommended procedures:

A. Turn the heater disconnect switch to the " OFF" position. Close the manual burner shut-off valve.

B. Loosen the union in the gas train.

CAUTION:
Igniter is made of silicon carbide material and should be handled with care to avoid breakage.

C. Disconnect the ignition cable from the burner and then remove the flame rod.

D. Examine the flame rod ceramic for cracks and replace if necessary. Clean dirt/grime build-up from the insulator.

E. Remove the fasteners that secure the burner to the housing. The burner will then be free to slide out.

⚠CAUTION:
Be sure to take necessary safety precautions
(such as wearing eye protection, etc.) before attempting this step.

F. Clean the burner by back-flushing using high pressure air (40-80 psi). Continue back-flushing until dust and debris has been completely expelled from the burner. Wipe all burner surfaces with a cloth to remove any foreign matter.

⚠CAUTION:
Cleaning the burner and the burner orifice with anything other than
compressed air may drastically affect heater performance.

G. Perform Discharge Air Temperature Sampling Tube cleaning at this time.

H. Reassemble the burner using the above steps in reverse order.

DISCHARGE AIR TEMPERATURE SAMPLING TUBE CLEANING

With the Burner out of the unit, clean the Discharge Air Temperature Sampling Tube located inside the unit. The Sampling Tube is located inside the discharge duct beyond the stainless steel burner extension(s). Clean the Sampling Tube using high pressure air (40-80 psi) until all debris is completely removed from the Tube.

ELECTRIC SHUT-OFF VALVE CLEANING

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise, or leakage will indicate that cleaning is required.

⚠WARNING:
In the extreme case, faulty valve operation will occur and the valve may fail to open or fully close.

IMPORTANT:
It is not necessary to remove the valve from the pipeline for cleaning.

⚠WARNING:
To prevent the possibility of severe personal injury or property damage, turn off electrical power, close the upstream manual gas valve, depressurize valve, extinguish all open flames and avoid any type of sparking or ignition. Vent hazardous or combustible fumes to a safe area before servicing the valve.

ASCO Gas Valves: Series 8214

Disassemble valve and clean all parts as follows:

IMPORTANT: If parts are worn or damaged, install a complete ASCO Rebuild Kit.

A. Remove the solenoid enclosure.

B. Remove the bonnet screws, valve bonnet, bonnet gasket, core/diaphragm sub-assembly and body gasket.

C. All parts are now accessible to clean or replace.

D. Lubricate the bonnet gasket and body gasket with a light coat of DOW CORNING® 200 Fluid lubricant or an equivalent high-grade silicone fluid.

E. Apply a light coat of RemGrit TFL 50® Dry Lubricant to: Valve seat; Valve body surface where the diaphragm assembly contacts the valve body and body gasket; and the internal surface of the valve bonnet where the diaphragm assembly contacts the bonnet when the valve is in the energized (open position).

IMPORTANT:
If the valve has been disassembled for inspection and cleaning only and a Rebuild Kit is not being installed, lubricate the following with RemGrit TFL 50® Dry Lubricant:

- Diaphragm assembly on both sides
- Main disc at base of core/diaphragm sub-assembly.
- Pilot disc at base of core assembly.

⚠ CAUTION:
Do not distort the hanger spring between core assembly and the diaphragm assembly when lubricating pilot disc.

F. Replace the body gasket and the core/diaphragm sub-assembly with the closing spring attached. Locate the bleedhole in the core/diaphragm sub-assembly approximately 30˚ CCW from the valve inlet.

G. Replace the valve bonnet and bonnet screws (6). Torque the screws in a crisscross manner to 100 ± 10 inch lbs. Replace the solenoid and make the electrical hookup.

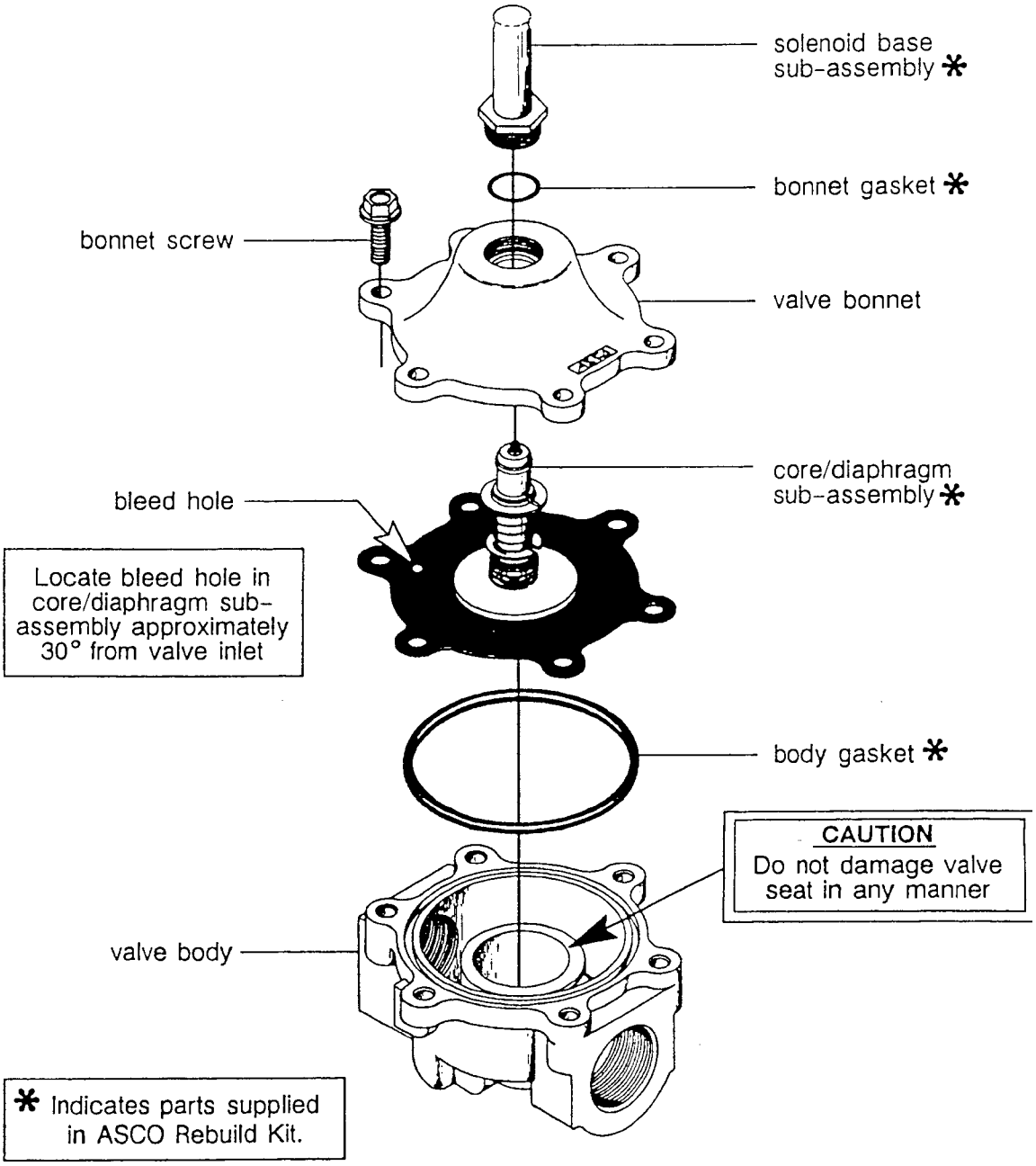
⚠WARNING:
To prevent the possibility of severe personal injury or property damage, check valve for proper operation before returning to service. Also perform a gas valve leak check and gas train leak check.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded views are supplied in Rebuild Kits.

When ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

Disassembled View of ASCO Valve


solenoid base sub-assembly *
bonnet gasket *
bonnet screw
valve bonnet
core/diaphragm sub-assembly *
bleed hole
Locate bleed hole in core/diaphragm sub-assembly approximately 30° from valve inlet
body gasket *
CAUTION
Do not damage valve seat in any manner
valve body
* Indicates parts supplied in ASCO Rebuild Kit.

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
I. **NO BLOWER OPERATION**	***1. Heater Disconnect***	
	a) Disconnect in "OFF" position	a) Turn disconnect "ON"
	2. Blower ON-OFF Switch	
	a) Switch in OFF position	a) Place switch in the "ON" position
	b) Defective switch	b) Replace switch
	3. Control Transformer	
	a) No input voltage	a) Check disconnect and supply fusing
	b) Blown control fuse	b) Replace control fuse
	c) Defective transformer	c) Replace transformer
	4. Motor Protection	
	a) VFD in alarm	a1) Check primary power source a2) Cycle VFD with disconnect a3) Reduce motor speed using air volume control
	b) VFD defective	b) Replace VFD
	5. Motor	
	a) No input voltage	a) Check primary power source
	b) Improper voltage	b) Consult factory
	c) Defective motor	c) Replace motor
	6. Blower Damage	
	a) Defective or locked bearings	a) Replace bearings
	b) Check for physical damage	b) Replace or repair blower
	7. Belts	
	a) Belt slipping	a) Tighten belts
	b) Belt broken or missing	b) Replace belts
II. **BLOWER RUNS; NO HEAT; FLAME SAFETY RELAY DOESN'T LOCK OUT**	***1. Burner ON-OFF Switch***	
	a) Switch in "OFF" position	a) Place switch in "ON" position
	b) Defective Switch	b) Replace Switch
	2. Air Flow Switch	
	a) Blower running backwards	a) Reverse any two of the three motor leads to the VFD
	b) Belts slipping	b) Tighten and/or replace belts
	c) Blocked intake or discharge	c) Find and remove obstruction
	d) Clogged airflow tubing or pickup ports	d) Clean or replace tubing or pickup ports
	e) Excessive static pressure or low airflow	e1) Increase motor speed using air volume control dial e2) Decrease length of ducts or

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
		bends in ducts
		e3) Increase exhaust by opening windows or by mechanical means
	f) Switch defective	f) Replace switch
	3. Flame Safeguard Relay (FSR)	
	a) No input voltage	a) Check wiring
	b) Defective FSR	b) Replace FSR
III. **BLOWER RUNS; NO HEAT; FLAME SAFETY RELAY LOCKS OUT**	***1. Igniter***	***During trial for ignition:***
	a) No current (open igniter)	a) Check igniter current (1.6 AMPS)
	b) No voltage	b) Check FSR output to igniter (24 VAC)
	2. High Limit	
	a) High limit tripped	a) See Problem Number VI
	3. Electric Shut-off Valve	
	a) No input voltage	a1) Check FSR output to R1 relay during ignition trial
		a2) Check electric shut-off valve circuit and wiring
	b) Gas valve does not open	b1) Compare supply voltage to nameplate voltage
		b2) Clean and/or replace electric shut-off valve parts
	c) Defective electric shut-off valve	c) Replace valve
	4. Modulating Valve	
	a) Minimum fire set too low	a) Adjust minimum fire on modulating valve (See page 26)
	5. Regulator	
	a) Clogged vent orifice	a) Clean or replace orifice
	b) No supply pressure	b) Check manual shut-off valve and piping
	c) Improper manifold pressure	c) Adjust appliance regulator per nameplate
	d) Defective regulator	d) Replace regulator
	6. Burner	
	a) Burner defective	a) Replace burner
IV. **BLOWER RUNS; BURNER LIGHTS; FLAME SAFETY RELAY LOCKS OUT**	***1. Low Flame Current (μA)***	
	a) Dirt build-up on flame rod ceramic insulator	a) Clean dirt deposit from ceramic surface and install protective boot
	b) Minimum fire set too low	b) Adjust minimum fire on modulating valve (See page 26)
	c) Flame rod defective	c) Replace flame rod

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	d) Burner defective	d) Replace burner
	2. No Flame Current	
	a) Ground connection open	a1) Reference T1 transformer to ground
		a2) Tighten loose ground screws
	b) Flame rod wire termination oxidized	b) Clean terminal and reinsert
	c) Flame rod defective	c) Replace flame rod
	3. Fluctuating Flame Current	
	a) Unit over firing	a) Check manifold pressure
	b) Minimum fire set too low	b) Adjust minimum fire on modulating valve (See page 26)
	c) Intermittent ground connection	c) Tighten all ground points
	d) Loose terminal on Flame Rod	d) Tighten jam nuts
	e) Flame rod defective	e) Replace flame rod
	d) Burner defective	d) Replace burner
	4. Flame Safeguard Relay	
	a) Defective FSR	a) Replace relay
V. **BLOWER RUNS; UNIT HEATS; SHORT CYCLES WITHOUT RESETTING**	***1. Air Flow Switch***	
	a) Blower running backwards	a) Reverse any two of the three motor leads to the VFD
	b) Belts slipping	b) Tighten and/or replace belts
	c) Blocked intake or discharge	c) Find and remove obstruction
	d) Clogged airflow tubing or pickup ports	d) Clean or replace tubing or pickup ports
	e) Excessive static pressure or low airflow	e1) Increase motor speed using air volume control dial
		e2) Decrease length of ducts or bends in ducts
		e3) Increase exhaust by opening windows or by mechanical means
	f) Switch defective	f) Replace switch
	2. Flame Safeguard Relay	
	a) Defective FSR	a) Replace FSR
VI. **HIGH LIMIT TRIPPED**	***1. High Limit***	
	a) High limit will not reset	a) Replace high limit
	2. Unit Overfiring	
	a) Excessive manifold pressure	a) If NG - adjust appliance regulator per heater nameplate
		a2) If LP - adjust regulator per heater nameplate - check resistance of the resistor

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	3. Airflow Reduced	
	a) Blower running backwards	a) Reverse motor direction
	b) Belts slipping	b) Tighten and/or replace belts
	c) Blocked intake or discharge	c) Find and remove obstruction
	4. Temperature Control System	
	a) Temperature control system does not modulate	a) See problem VII
VII. **MODULATING VALVE DOES NOT MODULATE; CONTINUOUS HIGH FIRE**	***1. Amplifier***	
	a) Wire(s) not connected to amplifier	a) Re-install wire(s)
	b) Amplifier defective	b) Replace amplifier
	2. Discharge Temperature Sensor	
	a) Discharge air temperature sampling tube clogged	a) Clean Discharge Air Temperature Sampling Tube (see page 18)
	b) Open in sensor circuit	b) Replace the sensor if the resistance measured at device exceeds 24,000Ω or is less than 7,000Ω.
	c) Sensor cross-wired to amplifier	c) Correct wiring terminations
	3. Space Temperature Selector (EDSM only)	
	a) Open in sensor circuit	a) Replace the sensor if the resistance of sensor circuit is less than 7,000 Ω
	b) Induced voltage in field wiring	b) Utilize shielded, twisted pair wiring
	c) Space sensor located improperly	c) Remote space sensor in cold draft - relocate
	4. Modulating Valve	
	a) Foreign material holding valve open	a) Replace valve
VIII. **MODULATING VALVE DOES NOT MODULATE; CONTINUOUS LOW FIRE**	***1. Modulating Valve***	
	a) Valve coil is open or shorted	a) Replace valve if coil resistance is less than 40 Ω or greater than 85 Ω
	2. Class II Transformer	
	a) No voltage output to amplifier	a) Replace transformer
	3. Amplifier	
	a) No output voltage to valve	a) With the wire removed from terminal 3 of amplifier, replace amplifier if the valve voltage does not exceed 18 volts DC.

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	4. Discharge Temperature Sensor a) Short in sensor circuit	a) Replace the sensor if the resistance measured at device exceeds 24,000Ω or is less than 7,000Ω.
IX. ERRATIC OR PULSATING FLAME	***1. Amplifier*** a) Hunting	a1)Adjust sensitivity control dial counter-clockwise a2) Clean discharge temperature sensor
	b) Defective Amplifier	b) Replace amplifier
	2. Remote Space Sensor (EDSM only) a) Induced voltage in field wiring	a) Utilize shielded, twisted pair wiring
	b) Remote space sensor located improperly	b) Sensor located in heated air stream - relocate

MINIMUM FIRE ADJUSTMENT PROCEDURE

The minimum fire setting is preset at the factory at approximately 25˚F rise for NG and approximately 40˚F rise for LP. If an adjustment is necessary, a DC microammeter is required to monitor flame signal during the adjustment procedure to ensure the flame current remains steady and of sufficient strength to maintain burner operation for both consistent ignition at minimum fire and locking in the flame safeguard relay. Do not allow the flame signal to drop below 2.0 microamps DC.

A. Turn the Disconnect to the "ON" position and monitor the discharge temperature.

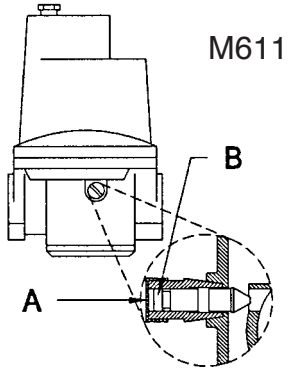
B. Remove the wire from terminal No. 8 on the amplifier.

C. Turn the Burner ON-OFF Switch to the "ON" position and monitor the discharge air temperature. Subtract the temperature from Step A above from this reading to determine the temperature rise.

D. Remove the cap (A), located on the front of the valve, exposing the minimum fire adjusting screw. Using a small flat head screw driver, turn the adjusting screw to obtain the desired minimum fire setting.

E. Replace the cap (A)

F. Reconnect the wire to amplifier terminal No. 8.



MAINTENANCE LOG

MODEL NO. _____ **SERIAL NO.** _____

Date	Activity	Technician

RX-Series heaters are manufactured by Cambridge Engineering, Inc. which reserves the right to change specifications, modify the design and/or substitute equivalent materials without notice as the result of code requirements, product enhancements, ongoing research/development and vendor changes beyond our control.

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RxHeat™